five hundred and eighty-nine forms occur in the Amazons valley, twenty-seven and one-half per cent. in Venezuela, thirty-three per cent. in Columbia, thirty-six and one-half per cent. in Ecuador, forty-seven and one-half per cent. in Peru, thirty-three per cent. in Southeast and Central Brazil. The West Indies have but four per cent. of the birds of Guiana, or no more than are possessed by the Argentine Republic.

MAMMALIA.—The Central American Mammalia, dealt with by the late Mr. E. R. Alston, consist of one hundred and eighty-one species; Cetacea are not included in the work. Fifty-two of these species are bats, sixty rodents, and eleven quadrumana. The last are Neotropical forms that have penetrated northward. One only, *Ateles vellerosus*, has spread into Mexico to twenty-three degrees N. lat. The cats are southern or wide-spread, the dogs all northern. Seven out of the eight known Procyonidæ are found here, the exception being *Nasua rufa* of Brazil. Four species of Cariacus, the big-horn sheep, the prong-buck, two peccaries and two tapirs are the sole Ungulata. Among edentates three kinds of anteater, an armadillo, three sloths, and seven opossums extend beyond Panama.

EMBRYOLOGY.[1]

The Formation of the Eggs and Development of Rotifers.[2]—G. Tessin has made a very important contribution to the life-history of the wheel-animalcules, which he has traced in *Brachionus urceolaris*, *Euchlanis dilatata*, *Salpina mucronata*, and *Rotifer vulgaris*, having succeeded in obtaining satisfactory sections of the embryos in a number of stages.

The large simple sac opening into the cloaca, which has hitherto been regarded as the ovarium, is, according to Tessin, not an ovary at all, but the eggs are developed on the outside of this organ from a heap of cells lying on its right side and near its anterior end. As a rule, the number of nuclei in the ovarian mass is constant, eight nuclei being the usual number; only in the fixed Tubicolariæ, Philodinæ, and Pterodina could a larger or smaller number of ovarian nuclei be made out.

In the process of maturation the nucleus of the egg gradually passes to the periphery, where it breaks up; but before it does so a nuclear spindle is developed. This process Tessin regards as an indication that polar cells are extruded, although he did not actually succeed in finding them.

None of the accounts hitherto given of the manner of segmentation are correct, according to this author. The egg is first divided transversely into two unequal cells, the cleavage plane being also slightly oblique, and the larger cell anterior, the smaller

[1] Edited by Dr. JOHN A. RYDER, Philadelphia.

[2] Ueber Eibildung und Entwickelung der Rotatorien, Zeitschr. f. Wiss. Zoologie, xliv., 1886, pp. 272–302, pls. xix., xx.

posterior. The larger cell is next divided transversely, a smaller mass being segmented from it behind. Then follows the division in twain of the smaller of the two primary cells. The four resulting blastomeres then assume a symmetrical disposition with respect to the future median axis. The three posterior smaller cells mark the future dorsal aspect of the body; the larger cell marks the position of the future anterior end.

From this point onward the segmentation is essentially meroblastic, the smaller posterior and dorsal cells segmenting and investing the larger anterior cell from behind forwards and laterally by a process of epiboly. Meanwhile, the posterior acuminate end of the large anterior cell becomes segmented into a number of cells, which take a share in the formation of the ectoderm, together with the smaller dorsal cells already spoken of. While the formation of the entoderm is thus accomplished, the most anterior row of the dorsal group are destined, as shown by later events, to form the mesoderm. By this time the larger anterior cell has been further subdivided, and its component blastomeres to the number of five, which form the rudiment of the endoderm, are included by the growth forward and downward of the advancing ectoderm. The mesodermic cells, which at first formed a transverse row at the edge of the dorsal group of ectodermic cells, are pushed farther forward and downward, and are finally thrust inward between the ectoderm and mesoderm along the anterior, or what may finally be regarded as the dorsal, border of the blastopore or prostoma. Since the mesoderm is developed in almost all bilateral forms from the entoderm, the development of it from the ectoderm in Rotifers, as here described, is probably characteristic and of taxonomic importance. A solid gastrula (sterro-gastrula) is thus formed, and the prostoma (blastopore) assumes an anterior ventral position and marks the place where the permanent mouth is developed. The genesis of the mesoderm in Rotifers is contrasted with the mode of its origin in Astacus, according to Reichenbach, at the anterior margin of the blastopore. It is thought probable that the musculature and sexual organs are developed from the mesoderm.

The blastopore assumes a quadrate form, and the ectoderm bounding it is divided into four well-marked lobes,—a right and left, an anterior and a posterior lobe. From the invaginated portion of the ectoderm, lying within the blastopore, the œsophagus (which lies in front of the mastax) and the wheel-organ or trochal disk are developed. The posterior lobe of the ectoderm becomes divided off posteriorly from the blastopore by a transverse fissure or constriction, leaving the posterior lobe free, which thus becomes the rudiment of the young Rotifer's tail. The anterior and lateral lobes, bounding the blastopore, finally blend and become differentiated into the cephalic extremity of the animal.

The metamorphosis of the entodermal mass of cells already

mentioned is very remarkable. The entodermic cells form a solid globular mass, filling up for a time the hinder three-fifths of the still nearly solid gastrula. This mass is next subdivided into a sharply circumscribed anterior portion, in which the mastax is developed, and a posterior portion, from which the rest of the alimentary tract is formed.

As a result of these elaborate and apparently very successful studies, Tessin concludes that the Rotifers are not affiliated very closely with the higher Annelids, but, on the one hand, with the Turbellaria, and on the other with the Crustacea; with the former on account of the well-marked lobes around the blastopore and the mode of origin of the mesoderm, and with the latter on account of the mode of invagination of the mesoderm at the anterior margin of the blastopore, the development of a post-abdomen with a forked tip, the position and fate of the blastopore, and the somewhat similar position of the anus in some aberrant forms of Crustacea (*Cetochilus*). In summing up he concludes that the Rotifers form a special group, which should be placed somewhere between lower worms and Crustacea.

The Gestation of Armadilloes.—A very remarkable mode of uterine gestation has very recently been described by Von Jhering[1] in a Brazilian armadillo (*Praopus hybridus*). Though the notice published by this observer is a very brief one, and evidently preliminary, the conclusions arrived at are novel and of great interest, as indicating that it is possible that a mode of reproduction may occur in a mammal simulating parthenogenesis. The natives informed him that the female armadillo always produced litters of young, the individual members of which were invariably of only one sex. This observation he had been able to fully confirm and to announce that the fœtuses of a single litter are enveloped in a common chorion,[2] and, while the placenta of each fœtus is discoidal, the individual placentæ of the litter are so disposed as to form a compound zonary placenta. These two sets of facts led Von Jhering to conclude that all the young produced at one litter by the armadillo are the product of the fertilization of a single egg, which produced a number of embryos by the fission or subdivision of that ovum subsequent to impregnation.

New observations were made upon the development of the claws of the young armadilloes, which Von Jhering found were developed in a singular manner, obviously recapitulating some of the characteristics of the extinct forms.

The reviewer gives a synopsis of Von Jhering's arrangement of the types or principal modes of reproduction. Two great subdivisions are recognized:

[1] Biolog. Centralbl., vi. pp. 532–539 (No. 17, 1886).

[2] It is significant in this connection that when human twins are enveloped in a common chorion they are always of the same sex.

1. Hologeny. From the fertilized egg but one individual takes its rise, with or without metamorphosis. Hypogenesis (Haeckel).

2. Merogeny. From the fertilized egg two or more individuals are developed, which,—

A. Revert directly to the form and manner of reproduction of the parent. Temnogenesis.

B. Develop into individuals which become different, or a series of generations, varying in their mode of development (alternation of generations, metagenesis).

a. Calycogenesis (Salpa, Medusæ).

b. Paidogenesis (Cecidomyia).

c. Heterogenesis, in which either both generations are sexually reproduced, or one or several are reproduced parthenogenetically.

The peculiar type of reproduction called "temnogenesis" by Von Jhering, and characteristic of *Praopus hybridus*, leads to the somewhat paradoxical conclusion that the mother may become the grandmother of her own child, in virtue of the segmentation of the ovule into a number of distinct germs, which lead to the development of as many distinct individuals of the same sex. The same thing apparently occurs when in the human subject twins are invested by a common chorion. The subject, however, needs further investigation, especially since the researches of Dareste, Fol, Kleinenberg, and especially of Rauber, have so greatly extended the views of Lereboullet in respect to the mode of origin of double monsters among vertebrates or pleurogastric types. That the production of double monsters occurs among hypogastric types in essentially the same way as in the vertebrates seems to be pretty conclusively established by Mr. Ryder's observations upon double monstrosities among lobster embryos.

ANTHROPOLOGY.

Chinese Jade in America.—In the "Proceedings of the American Antiquarian Society," vol. iv. p. 62, Mr. Frederick W. Putnam makes a report of jade objects which have a double interest. Twelve specimens are reported from Nicaragua and Costa Rica, ten of which were ornaments made by cutting celts into halves, quarters, or thirds, a portion of the cutting edge of the celt remaining on each piece. The method of sawing the objects is indicated. The first query, therefore, is, For what reason should a celt of such hard material be cut up and perforated? Let us suppose that the original blade belonged to the outfit or accoutrement of a celebrated warrior, hunter, or artist. The pieces of that blade would become powerful medicine or influential fetishes and highly prized.

Greater astonishment is excited when we read the report of Mr. O. W. Huntington upon the nature and source of the material in these ornaments. It is as follows: "The specimens